# Operating System Notes

## BIOS

BIOS is Basic Input Output System. The most important work of BIOS is to find the bootable device. BIOS provides the first set of instructions for the microprocessors to execute. Usually BIOS is either stored in a flash memory or a ROM. Some of the other tasks of the BIOS are

1. Power On Self Test (POST) – To test different hardware in the mother board on power up.
2. Activating other BIOS chips in the mother board. Example suppose you have a graphics card that will have its own BIOS.
3. Provide instructions which can interact with hardware’s like keyboard, monitor, ports etc. for the operating system – Interrupts and drivers
4. Manage some settings related to Hard disk, clocks, etc.

BIOS usually follows this sequence when executing in an Intel processor and motherboard supporting that processor.

1. BIOS stores most of its setting information in a CMOS chip. This has usually a very small RAM probably 64bytes. First thing BIOS does when it runs is check the CMOS chip for custom settings.
2. Load the interrupt handlers and device drivers. Basically it will copy the code related to interrupt handlers and device drivers (very naïve drivers) to RAM.
3. Initialize Registers and power management. Along with this it will check in CMOS, if there are any other BIOS chips, like video BIOS chip etc. It will initiate those chips.
4. Perform the power-on-self-test (POST). If at address 0000:0472, it has value 1234h then it means it is doing a warm boot of the system rather than a cold boot. In case of warm-boot, it will skip the POST. In POST test it will verify RAM by reading/writing on every memory address. It will do checks on PCI cards, USB ports for mouse and keyboard. Usually when you restart by pressing ctrl+alt+delete then it will result in warm boot. Otherwise it is a cold boot. As per the windows, it looks like restart will result in warm boot where as shutdown will result in cold boot.
5. Display System Settings – It will display certain information about the system like processor, memory, BIOS details, etc.
6. Determine which devices are bootable. – It will obtain the bootable device order from the CMOS chip. Starts checking each of the bootable device for a bootloader.
7. Jump to location where bootloader code was copied.

The BIOS program is always located in a special reserved memory area, the upper 64K of the first megabyte of system memory (addresses F000h to FFFFh). When the processor first starts up, memory is completely blank. So every processor is preprogrammed to always look at the same place in the system BIOS ROM for the start of the BIOS boot program. This is usually location FFFF0h. This location just contains the jump instruction telling processor where to go to find the actual BIOS startup program.

The code segment register is initialized with selector F000h, base as FFFF0000h, and limit FFFFh, so that execution starts at 4GB minus 16 bytes (FFFFFFF0h). The platform logic maps this address into the System ROM, mirroring address 000FFFF0h.

BIOS after POST will call int 19 h interrupt to start the booting process. BIOS will copy the 1st sector to RAM at address 0x0000:0x7C00. 1 sector is 512 bytes. BIOS will check last 2 bytes and compares it to 0x55 and 0xAA to make sure it is boot loader. BIOS loads all the interrupt vector table below address 0x00400. From address 0x400 till 0x500 is reserved for the BIOS in the RAM.

BIOS in PLP OS

## References

### BIOS

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<http://www.pcguide.com/ref/mbsys/bios/index.htm>

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